IDE Search Engine Report

A search engine to find coding solutions right in your IDE

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ABSTRACT

Whether you are a novice or advanced programmer, everyone has gotten stuck writing code and has needed some help. Most will go to Google for answers or Stack Overflow to see code solutions, but many times, it is difficult to find exactly what you are looking for. While Google is helpful for looking up definitions, terminologies, etc., there is so much information out there that it can be overwhelming. Furthermore, when working on a program or project in your IDE, it can be annoying to have multiple tabs open looking up solutions to your problems. For example, if you are coding and you do not know how to construct a for loop, you must open a browser and find a website that clearly defines how to make one. The solution to all these problems would be having a search engine that lives directly inside the IDE. The search engine would be for a wide variety of programming related questions, such as simple definitions as well as helpful solutions to complex programs. Furthermore, it would be advanced enough so that the engine could see what you are working on, and it would tailor its results to your exact needs. Not having to leave the IDE as well as the search engine providing useful feedback would make any software engineer's life much easier. Throughout the course of planning and going through the process of receiving feedback and scrum meetings, there have been problems that we encountered and resolved. Defining certain important aspects of the program via creating use cases as well as conducting requirements analysis and discussing high level and low-level designs have made organizing our project significantly easier.

INTRODUCTION

Having issues with your program happens time and time again, whether it is a bug or simply not knowing how to instantiate something. For those that are more basic programmers, it can be discouraging having to look up how to do every little thing in a language they are not familiar with. For example, a user might have to look up how to simply create a variable. However, with the search engine, a clean and aesthetic window would pop up in which it asks for your query and uses AI technology to see the project you are working on. It will then give you an answer and explain how it came to that conclusion. So, say you were implementing part of a Java project that required removing a duplicate number from an array, but you can't comprehend how to remove something from it since it is static. In this case, the engine would see the method you are working on and would tell you that you need a count variable, for example, that will keep track of where the duplicate number is, and a loop that will replace that index with a number further in the array. It would show you how to implement it and why it is doing it that way. This tool is so important, because many times when beginner coders run into an issue, they might be discouraged and not want to continue trying to solve the problem. Having a convenient search engine would help make programming much more enjoyable and would also give helpful explanations so you are learning at the same time. Similarly, for an advanced programmer that might not need simple explanations or definitions, the engine can still be used to look up how to fix a very specific bug or to debug code for you to see what the error is. This will prevent a software engineer from wasting time on a small bug when they could be implementing other aspects of the project. In both scenarios, the engine would be extremely helpful and would make coding more enjoyable for everyone.

More specifically, the problem that this IDE search engine would address is the inefficiency and the frustration that programmers face when attempting to find solutions to their coding problems. As mentioned, it is a pain to endlessly search sites such as Stack Overflow for answers, and it also disrupts workflow. The proposed solution would be leveraging AI technology to understand the context of the programmer's code and offered personal and tailored assistance. Furthermore, it would also double as a search engine, allowing the user to search for a specific problem that might be discovered via the AI scanning project. This revolutionary solution would streamline the coding process and would allow the user to complete a project without even having to leave their IDE. This would enhance productivity, efficiency, and would help users learn while they are coding.

MOTIVATING EXAMPLE

While the idea and the use of the IDE search engine has been established, a more specific example will shed more light on the exact innerworkings of the software. Imagine a team of software developers working on a complex project for their company and among them is a new hire Alex who does not have the same experience that other members of the group have. The entire team has been assigned to this project and while there is clear communication and guidelines, each member still has to code on their own and contribute to the project. However, Alex's coding

skills are rudimentary and immediately when beginning to code in Eclipse for Java Developers, he runs into a bug in a for loop that needs immediate resolution. Normally, Alex would surf the web to try to find a solution, but he made sure to install IDE Search Engine to Eclipse beforehand. Alex opens the search engine and there are two specific options. One with a search bar that allows him to essentially ask the AI any question he has and another that scans a section or the entire code and offers direct feedback. Alex decides to scan the code and immediately a sidebar pops up that highlight's specific parts of the code and gives feedback and explains each line and method. By viewing the feedback, Alex can fix his error swiftly and he can continue working on the project without any further hiccups.

On the other hand, in the same team working on the same project is another member named Ella, and she is a more experienced software engineer that is tasked with a more challenging aspect of the project. While working, she ran into a very specific bug that caused a lot of the method to stop working. Like Alex, she opened IDE Search Engine, this time using the search engine feature that is essentially a Chatbot tailored specifically for coding. She gave the AI a detailed question asking it about the logic for Floyd's Algorithm and how it uses triple for-loops to calculate shortest paths in a directed weighted graph. While it did not directly analyze her code, it gave a detailed step by step explanation of what the algorithm does and the logic behind it. From this information and her experience, she was able to understand the feedback and fix the bug in the algorithm.

While both Alex and Ella had very different problems and used different aspects of the search engine, IDE Search Engine benefited the team tremendously. While it may not be directly apparent, the engine made teamwork significantly easier by improving the team's workflow and allowing each individual person to make progress on their own. Alex was able to fix his bug and learn more about Java, while Ella was able to use her experience and the feedback to alter her code and fix the algorithm. This specific example highlights the relevance of the software to programmers working together and how it assists group members and workflow regardless of experience.

BACKGROUND

For our search engine IDE, there are some key definitions that will help lay the framework of the purpose and functionality for our project. The first term to establish has to do with an IDE or an integrated development environment, which is a software application that helps programmers develop software code efficiently [1]. An IDE is essentially where a user programs in and there are many popular ones, most notably Visual Studio Code, Eclipse IDE, PyCharm, etc. The IDE is vital for our project because it is where the search engine plugin will exist in. Another concept that is important has to do with artificial intelligence, specifically a chatbot that is tailored to answering code-based questions. A chatbot is a computer program that simulates conversation with an end user [2]. A specific feature of our program will be our program having a pop-up search bar that will let the user ask questions about specifically programing terminology or errors. This would work as a chatbot in which the computer or search engine would talk to you and give you back relevant feedback. While many chatbots do not use AI technology, ours would need to understand the user's questions and then automate specific responses to them.

RELATED WORK

While having a search engine directly inside the IDE is a unique idea, the concept stems from existing engines and websites that are out there including AI software such as ChatGPT and other resources like Stack Overflow. The first related work is Stack Overflow, which helps people find programming answers that they need by simply looking up a similar question or posting a question with code on the website. In turn, other people will respond to the question thread with relevant help and coding solutions [3]. Stack Overflow has proved itself to be a very useful resource for many programmers, however an issue seems to be that there is too much information on the site and a lot of complex code and solutions that might confuse a beginner or even intermediate programmer. Another relevant software engineering tool is ChatGPT. While it is generally advised to steer clear of AI software for writing code since it does not help you learn if you use it to simply write code for you, ChatGPT can be useful for explaining how code works or for understanding terminology. ChatGPT is a language processing tool that is driven by AI technology and can answer questions and assist you with tasks [4]. ChatGPT can be useful if you need to quickly figure out how to write some code and it can also help debug code that you are working on. The downside is ChatGPT can also be spotty, and the AI technology might result in incorrect results. However, combining these two resources and putting it into one search engine inside an IDE would solve many of the problems that people face when trying to look up how to fix their code.

IMPLEMENTATION

The process we have selected for completing this project is an Agile approach, specifically having Scrum meetings and sprints. Since this is a group project with a complex goal in mind, having Scrum meetings would enhance collaboration and make sure that we are all on the same page in terms of design and implementation. Having designated sprints in which a set amount of work will be completed will also help with reaching specific deadlines and making sure that we make the necessary progress on the project. Having daily Scrum meetings, whether they be in person or over text or call, will help make sure that every team member is doing the work they need to be doing and making sure they we all communicate our obstacles and progress. Furthermore, using this method will make sure that the project is collaborative, and the work is incremental, so we can complete the project in an efficient manner.

While using Agile methodology helps with staying organized as a team, there were also design decisions and processes that helped in terms of planning and organizing this project. One of the main things that we organized was the high-level design of our project, referring to the overall system and the design of the architecture. The high-level architectural pattern that we felt was the most efficient for our project was Model-View Controller. The Model-View Controller structure helps with keeping things organized and thinking about our project in a way that is recursive and works as a cycle. The steps of this model go in the order of user, controller, model, and view. Specifically for our project, the first stage is the User in which the search engine is used for either searching for feedback or using it to scan a current class or section of code. Then, the user input is sent to the controller stage which manipulates and handles the input in such a way that it can be sent to the model. The model is the main portion of implementation because it deals with turning the input into output and uses AI to create feedback. The feedback is then sent and updated to the view stage which deals with displaying the UI and information in an aesthetically pleasing way. Lastly, the view sends this information back to the user and the cycle repeats itself. Using this high-level design was crucial for planning out the project and understanding the general workflow of how information will be sent and received.

DEPLOYMENT PLAN

If our project was released to a user base, then we would need a specific deployment plan. Broken down as follows, the three stages would deal with pre-release, release, and post-release.

The first stage of the process would be with pre-release preparation in which there would be a closed beta testing phase. This would involve a group of test users or even programming teams that will use our engine for a set amount of time. This testing phase is important because it would give us as developers a lot of important feedback and it could also identify potential bugs or usability issues. Furthermore, it would allow us to assess the user experience and see if there are any changes that need to be made. Also, documentation creation would be important, giving detailed steps on how to use our program as well as troubleshoot material. These resources would be extremely important during the initial stages.

The next stage of the project would be the release strategy which is when we would make our project public and have a rollout. The initial deployment of our project would deal with specific IDE platforms, and we would work with these platforms and companies to make sure everything goes smoothly. Potential challenges would likely arise during this process, and we would make sure to carefully be watching the feedback and the problems with our search engine. Further, version control mechanisms would be in place that would let users gain access to previous versions of our software if a new update had bugs. Lastly, communication would be extremely important during this stage; we could have a discussion board that would let users write the positives and negatives of our search engine. Taking these comprehensive measures would ensure the longevity of our project.

The last phase for deployment would be post-release maintenance and this would be ongoing for the entire duration of our plugin existing. Regular updates and bug fixes will be consistently delivered based on problems that we encounter as well as user feedback and demands. Also, continuing to monitor user feedback would allow us to make improvements and add new features that people request. In terms of the software, we would have a team that would be running constant tests to make sure the code, search bar, AI, etc. would be working up to speed. This might be the most important step of deployment because it requires being constantly attentive and flexible while the IDE search engine is up and running. In terms of on our end, we will still using Agile Development to make iterative improvements and release updates regularly based on feedback and technological advancements. Furthermore, maintenance will be done such as patch management to address and fix bugs as well as security updates to prevent potential breaches. This comprehensive three step plan would ensure that our project is developed and maintained effectively with little to no hiccups during the process.

DISCUSSION

While the basic framework of our project has been laid out, there are certain ways that our project could be expanded upon and there are also problems and limitations that might become apparent. The first thing that we could focus on is broadening the languages that the search engine supports. By incorporating more programming languages and integrating more frameworks and libraries, our search engine could be used for more purposes. Furthermore, we could work on advancing our AI technology for deeper code analysis. There are also features for users that would be helpful to implement, including a way to have a code-sharing system so users could collaborate on the same code. Another feature to add could be a way to save feedback for future viewing which would make implementing a project significantly easier.

However, while charting these expansions, there are certain limitations that could become more apparent upon further implementation. For example, while mentioned before that ChatGPT and Stack Over Flow often give back incorrect solutions, our project could run into the same problems. Furthermore, there could be privacy and security concerns regarding storing data within the engine. On top of this, the AI feedback could have a learning curve, meaning there is a chance that the user doesn't understand the feedback that the engine provides.

Navigating these opportunities and limitations is critical for making sure our project is successful and while there could be challenges with this, it will make our search engine significantly

better if we tackle these possible limitations as well as consider places to improve.

CONCLUSION

In conclusion, the creation of our IDE search engine would mark a significant stride in revolutionizing tailored programming assistance. This IDE plugin would present solutions that basic and advanced programmers run into, allowing them to receive helpful feedback without having to leave the IDE. Through an AI chat bot search engine as well as a code scanning system, the user could receive help that will make their programming experience easier. Over the course of the semester, we have used Agile development and software development processes to draft ways to implement the ideas as well as think about how to deploy and maintain the project. We have used Scrum meetings and planned design systems such as High-Level Design to make sure the project works as intended. Further, while we have discovered ways the make the project efficient and implement it, we have also acknowledged inherent limitations such as AI accuracy and security issues.

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